

What is claimed is:

1. A substrate holding apparatus for holding a substrate to be polished and pressing said substrate against a polishing surface, said substrate holding apparatus comprising:

a top ring body for holding a substrate;

an elastic pad brought into contact with said substrate;

10 a support member for supporting said elastic pad;

a contact member mounted on a lower surface of said support member and disposed in a space formed by said elastic pad and said support member, said contact member having an elastic membrane brought into contact with said elastic pad;

15 a first pressure chamber defined in said contact member;

a second pressure chamber defined outside of said contact member; and

20 a fluid source for independently supplying a fluid into or creating a vacuum in said first pressure chamber and said second pressure chamber.

2. A substrate holding apparatus according to claim 1, wherein said fluid source supplies a fluid controlled in temperature into said first pressure chamber and said second pressure chamber, respectively.

3. A substrate holding apparatus according to claim

1, wherein said contact member comprises a holding member for detachably holding said elastic membrane.

4. A substrate holding apparatus according to claim 3, wherein said holding member of said contact member is detachably mounted on said support member.

5. A substrate holding apparatus according to claim 1, wherein said contact member includes a central contact member disposed at a position corresponding to a central portion of said substrate, and an outer contact member disposed outside of said central contact member.

6. A substrate holding apparatus according to claim 5, wherein said outer contact member is mounted at a position corresponding to an outer peripheral portion of said substrate.

7. A substrate holding apparatus according to claim 1, further comprising a retainer ring fixed to or integrally formed with said top ring body for holding a peripheral portion of said substrate.

8. A substrate holding apparatus according to claim 7, wherein said top ring body comprises a cleaning liquid passage defined therein for supplying a cleaning liquid into a gap defined between an outer circumferential surface of said elastic pad and said retainer ring.

9. A substrate holding apparatus according to claim 7, wherein said retainer ring is fixed to said top ring body without interposing an elastic member between said retainer
5 ring and said top ring body.

10. A substrate holding apparatus according to claim 1, wherein said elastic membrane of said contact member has a partially different thickness.

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11. A substrate holding apparatus according to claim 1, wherein said elastic membrane of said contact member partially includes an inelastic member.

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12. A substrate holding apparatus according to claim 1, wherein said support member is made of an insulating material.

13. A substrate holding apparatus for holding a
20 substrate to be polished and pressing said substrate against a polishing surface, said substrate holding apparatus comprising:

a top ring body for holding a substrate;
a seal ring brought into contact with an upper
25 surface of a peripheral portion of said substrate;
a support member for supporting said seal ring;
a contact member mounted on a lower surface of said support member and disposed in a space formed by said

substrate and said seal ring and said support member, said contact member having an elastic membrane brought into contact with said substrate;

5 a first pressure chamber defined in said contact member;

a second pressure chamber defined outside of said contact member; and

10 a fluid source for independently supplying a fluid into or creating a vacuum in first pressure chamber and said second pressure chamber.

14. A substrate holding apparatus according to claim 13, wherein said fluid source supplies a fluid controlled in temperature into said first pressure chamber and
15 said second pressure chamber, respectively.

15. A substrate holding apparatus according to claim 13, wherein a communicating portion for allowing said fluid supplied to said first pressure chamber to contact a
20 contact surface of said substrate is formed in the lower surface of said elastic membrane of said contact member.

16. A substrate holding apparatus according to claim 13, wherein said contact member comprises a holding
25 member for detachably holding said elastic membrane.

17. A substrate holding apparatus according to claim 16, wherein said holding member of said contact member

is detachably mounted on said support member.

18. A substrate holding apparatus according to claim 13, wherein a protrusion radially protruding from a circumferential edge of said elastic membrane of said contact member is provided on the lower surface of said elastic membrane.

19. A substrate holding apparatus according to claim 13, wherein said contact member includes a central contact member disposed at a position corresponding to a central portion of said substrate, and an outer contact member disposed outside of said central contact member.

20. A substrate holding apparatus according to claim 19, wherein said outer contact member is mounted at a position corresponding to an outer peripheral portion of said substrate.

21. A substrate holding apparatus according to claim 13, further comprising a retainer ring fixed to or integrally formed with said top ring body for holding a peripheral portion of said substrate.

22. A substrate holding apparatus according to claim 21, wherein said top ring body comprises a cleaning liquid passage defined therein for supplying a cleaning liquid into a gap defined between an outer circumferential surface of

said seal ring and said retainer ring.

23. A substrate holding apparatus according to claim 21, wherein said retainer ring is fixed to said top ring
5 body without interposing an elastic member between said retainer ring and said top ring body.

24. A substrate holding apparatus according to claim 13, wherein said elastic membrane of said contact member
10 has a partially different thickness.

25. A substrate holding apparatus according to claim 13, wherein said elastic membrane of said contact member partially includes an inelastic member.
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26. A substrate holding apparatus according to claim 13, wherein said support member is made of an insulating material.

20 27. A substrate holding apparatus according to claim 13, wherein said seal ring extends radially inwardly from an innermost position of a recess for recognizing or identifying the orientation of a substrate.

25 28. A substrate holding apparatus for holding a substrate to be polished and pressing said substrate against a polishing surface, said substrate holding apparatus comprising:

a top ring body for holding a substrate;

a support member having a contact member mounted on a lower surface thereof, said contact member being disposed in a space formed by said substrate and said support member and
5 having an elastic membrane brought into contact with said substrate;

a first pressure chamber defined in said contact member;

a second pressure chamber defined outside of said
10 contact member; and

a fluid source for independently supplying a fluid into or creating a vacuum in said first pressure chamber and said second pressure chamber.

15 29. A substrate holding apparatus according to claim 28, wherein said fluid source supplies a fluid controlled in temperature into said first pressure chamber and said second pressure chamber, respectively.

20 30. A substrate holding apparatus according to claim 28, wherein a communicating portion for allowing said fluid supplied to said first pressure chamber to contact a contact surface of said substrate is formed in the lower surface of said elastic membrane of said contact member.

25 31. A substrate holding apparatus according to claim 28, wherein said contact member comprises a holding member for detachably holding said elastic membrane.

32. A substrate holding apparatus according to claim 31, wherein said holding member of said contact member is detachably mounted on said support member.

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33. A substrate holding apparatus according to claim 28, wherein a protrusion radially protruding from a circumferential edge of said elastic membrane of said contact member is provided on the lower surface of said elastic
10 membrane.

34. A substrate holding apparatus according to claim 28, wherein said contact member includes a central contact member disposed at a position corresponding to a
15 central portion of said substrate, and an outer contact member disposed outside of said central contact member.

35. A substrate holding apparatus according to claim 34, wherein said outer contact member is mounted at a
20 position corresponding to an outer peripheral portion of said substrate.

36. A substrate holding apparatus according to claim 28, further comprising a retainer ring fixed to or
25 integrally formed with said top ring body for holding a peripheral portion of said substrate.

37. A substrate holding apparatus according to

claim 36, wherein said top ring body comprises a cleaning liquid passage defined therein for supplying a cleaning liquid into a gap defined between an outer circumferential surface of said substrate and said retainer ring.

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38. A substrate holding apparatus according to claim 36, wherein said retainer ring is fixed to said top ring body without interposing an elastic member between said retainer ring and said top ring body.

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39. A substrate holding apparatus according to claim 28, wherein said elastic membrane of said contact member has a partially different thickness.

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40. A substrate holding apparatus according to claim 28, wherein said elastic membrane of said contact member partially includes an inelastic member.

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41. A substrate holding apparatus according to claim 28, wherein said support member is made of an insulating material.

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42. A substrate holding apparatus for holding a substrate to be polished and pressing said substrate against a polishing surface, said substrate holding apparatus comprising:

a top ring body for holding a substrate;

an elastic pad brought into contact with said

substrate;

a support member for supporting said elastic pad;
and

a plurality of contact members mounted on a lower
5 surface of said support member, said plurality of contact
members each having an elastic membrane brought into contact
with said elastic pad and being independently pressed against
said elastic pad.

10 43. A substrate holding apparatus according to
claim 42, wherein said plurality of contact members are spaced
at predetermined intervals.

15 44. A substrate holding apparatus according to
claim 42, wherein said fluid source supplies a fluid
controlled in temperature into said first pressure chamber and
said second pressure chamber, respectively.

20 45. A substrate holding apparatus according to
claim 42, wherein a communicating portion for allowing said
fluid supplied to said first pressure chamber to contact a
contact surface of said substrate is formed in the lower
surface of said elastic membrane of said contact member.

25 46. A substrate holding apparatus according to
claim 42, wherein said contact member comprises a holding
member for detachably holding said elastic membrane.

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47. A substrate holding apparatus according to claim 46, wherein said holding member of said contact member is detachably mounted on said support member.

5 48. A substrate holding apparatus according to claim 42, wherein a protrusion radially protruding from a circumferential edge of said elastic membrane of said contact member is provided on the lower surface of said elastic membrane.

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49. A substrate holding apparatus according to claim 42, wherein said contact member includes a central contact member disposed at a position corresponding to a central portion of said substrate, and an outer contact member
15 disposed outside of said central contact member.

50. A substrate holding apparatus according to claim 49, wherein said outer contact member is mounted at a position corresponding to an outer peripheral portion of said
20 substrate.

51. A substrate holding apparatus according to claim 50, further comprising a retainer ring fixed to or integrally formed with said top ring body for holding a
25 peripheral portion of said substrate.

52. A substrate holding apparatus according to claim 51, wherein said top ring body comprises a cleaning

liquid passage defined therein for supplying a cleaning liquid into a gap defined between an outer circumferential surface of said elastic pad and said retainer ring.

5 53. A substrate holding apparatus according to claim 51, wherein said retainer ring is fixed to said top ring body without interposing an elastic member between said retainer ring and said top ring body.

10 54. A substrate holding apparatus according to claim 42, wherein said elastic membrane of said contact member has a partially different thickness.

15 55. A substrate holding apparatus according to claim 42, wherein said elastic membrane of said contact member partially includes an inelastic member.

20 56. A substrate holding apparatus according to claim 42, wherein said support member is made of an insulating material.

57. A polishing apparatus for polishing a substrate, comprising:

25 a polishing table having a polishing surface; and
a substrate holding apparatus for holding the substrate to be polished and pressing the substrate against said polishing surface, said substrate holding apparatus comprising:

a top ring body for holding a substrate;
an elastic pad brought into contact with said
substrate;

a support member for supporting said elastic pad;
5 a contact member mounted on a lower surface of said
support member and disposed in a space formed by said elastic
pad and said support member, said contact member having an
elastic membrane brought into contact with said elastic pad;

a first pressure chamber defined in said contact
10 member;

a second pressure chamber defined outside of said
contact member; and

a fluid source for independently supplying a fluid
into or creating a vacuum in said first pressure chamber and
15 said second pressure chamber.

58. A polishing apparatus for polishing a
substrate, comprising:

a polishing table having a polishing surface; and
20 a substrate holding apparatus for holding the
substrate to be polished and pressing the substrate against
said polishing surface, said substrate holding apparatus
comprising:

a top ring body for holding a substrate;
25 a seal ring brought into contact with an upper
surface of a peripheral portion of said substrate;
a support member for supporting said seal ring;
a contact member mounted on a lower surface of said

support member and disposed in a space formed by said substrate and said seal ring and said support member, said contact member having an elastic membrane brought into contact with said substrate;

5 a first pressure chamber defined in said contact member;

 a second pressure chamber defined outside of said contact member; and

 a fluid source for independently supplying a fluid
10 into or creating a vacuum in said first pressure chamber and said second pressure chamber.

59. A polishing apparatus for polishing a substrate, comprising:

15 a polishing table having a polishing surface; and

 a substrate holding apparatus for holding the substrate to be polished and pressing the substrate against said polishing surface, said substrate holding apparatus comprising:

20 a top ring body for holding a substrate;

 a support member having a contact member mounted on a lower surface thereof, said contact member being disposed in a space formed by said substrate and said support member and having an elastic membrane brought into contact with said
25 substrate;

 a first pressure chamber defined in said contact member;

 a second pressure chamber defined outside of said

contact member; and

a fluid source for independently supplying a fluid into or creating a vacuum in said first pressure chamber and said second pressure chamber.

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60. A substrate holding apparatus for holding a substrate to be polished and pressing said substrate against a polishing surface, comprising:

a top ring body for holding a substrate;

10 a plurality of annular members formed of an elastic material and brought into contact with said substrate;

a plurality of sections defined by said plurality of annular members, said plurality of sections being opened downwardly; and

15 a fluid passage for supplying a fluid into said plurality of sections.

61. A polishing method for polishing a substrate, comprising:

20 pressing a substrate against a polishing surface provided on a polishing table; and

polishing a substrate in such a state that a pressing force applied to a thicker area of a thin film on the substrate is made higher than a pressing force applied to a
25 thinner area of the thin film.

62. A polishing method for polishing a substrate, comprising:

pressing a substrate against a polishing surface provided on a polishing table;

defining a plurality of sections opened downwardly by a plurality of annular members formed of an elastic
5 material held into contact with a substrate; and

supplying a fluid into or creating a vacuum in said plurality of sections.